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The Role of Remittances in Migration Decision: Evidence from Turkish Migration ¶

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Abstract

In this study we analyse the impact of workers' remittances on the decision to migrate by means of cointegration analysis. In traditional migration theories, especially in human capital models, the decision to migrate is based upon comparison of expected future incomes in the sending and the receiving countries adjusted for the cost of migration. By contrast, the new economics of labour migration suggests that the migration decision is made jointly by the migrant and his family. One important element of this theory is the role of remittances that is absent in traditional migration theories. In this paper we test traditional migration theories against the new economics of labour migration. The study covers the Turkish migration to Germany over the period 1964-2004. A single cointegrating relation between the migration inflows and the relative income ratio between Germany and Turkey, the unemployment rates in Germany and Turkey, the trade intensity variable, and workers' remittances (relative to Turkish GDP) is found. We find workers' remittances to be significant in explaining migration both in the short- as well as in the long-run.

Keywords: Migration, trade, remittances, the new economic of migration, cointegration

JEL code: J61, F22, C32.

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1 Introduction

In this paper we analyse the role of remittances within a theoretical and empirical macro migration model. In traditional migration theories (Hicks, 1932; Sjaastad, 1962; Harris and Todaro, 1970), the decision to migrate is modeled as an investment in human capital and the difference between expected future incomes in the home and host countries, adjusted for the cost of migration is considered to be the main motivation to migrate. The expected future income streams in these models are conditioned on the labour market opportunities in the sending and receiving countries. By contrast, Stark (1991) considers the decision to migrate as a family decision rather than an individual decision within the theory of new economics of labour migration. According to this approach the decision to migrate is made jointly by the migrant and his family, and costs and returns are shared within self-enforcing contractual arrangements between the two parties. One important consequence of these arrangements is the existence of remittances, an element which is absent in traditional migration theories. Therefore, a significant coefficient on remittances in a migration model would suggest that the migrant and family make the location decision jointly, and compare their income opportunities at alternative locations together. While doing this, they take into account the amount of remittances that the family would receive.

In this paper we contribute to a better understanding of the role remittances play in migration decision. Analysis of remittances at the theoretical as well as at the empirical level has made considerable progress in recent years as surveyed in Rapoport and Docquier (2006).

The literature groups the effects of remittances into two main categories. The first group relates socio-demographic and micro-economic determinants of motives to remit and analyses their role in the decision to migrate at the micro level. The benchmark study is done by Lucas and Stark (1985). This study argues that the motives to remit can be purely altruistic, may originate from self-interest or may be due to a mutually beneficial agreement between the migrant and the family in the home country. The mutually beneficial agreement between the migrant and the family in the home country facilitates the decision to migrate and remittances constitute an important element in forming these arrangements. The second group considers macroeconomic effects of remittances by analyzing short- and long-run separately. Thus, remittances may have a short-run macroeconomic impact through their effects on prices or exchange rates (Djajic, 1986). However, the long run implications of remittances are found to be more significant. First, remittances impinge on households' decisions in terms of labour supply, investment, education, migration, occupational choice, fertility etc., with potentially important aggregated effects. Second, remittances may affect a country's long-term income inequality, (Stark et al., 1986, 1988; Taylor and Wyatt, 1996). These studies argue that remittances actually reduced economic inequality in the origin communities and contributed to alleviate liquidity constraints, through investments in new techniques and education, and encouraged further migration, McKenzie and Rapoport (2004). By contrast, Chami et al. (2003) find a negative and significant relationship between remittances and economic growth with a cross-section data set of 113 countries. This result is explained with the moral hazard or adverse incentive problem that recipients use remittances as a substitute for labour income and lower their work effort in the home country. However, Taylor (1999) finds an empirical support for the view that remittances are a positive factor in economic development. Therefore, the main focus of research on remittances has been so far the determinants of motives to remit and their effect on inequality and economic development and growth; and has touched slightly or indirectly on the effects of remittances on the decision to migrate.

Glytsos (1988), Connell and Brown (1995), Poirine (1997), Ilahi and Jafarey (1999) and van Dalen et al. (2005) have investigated the direct theoretical and empirical effects of remittances on the decision to migrate. Glytsos (1988) developed a model for the remittance determination that considers remittances as an important endogenous variable in the family decision making process on migration. However, empirically he only investigates the determinants of remittances for the Greek-German migration over the period 1960-1982. Connell and Brown (1995) find that remittances are mostly used to pay debts and the fares of subsequent migrants. Similarly, Poirine (1997) shows for the South Pacific that the "implicit loan" theory explains better remittance behaviour, remittances flows, remittance uses and therefore the decision to migrate than the "alturistic", "self-interest" or "co-insurance" theories. Ilahi and Jafarey (1999) find for Pakistan that international migration costs are quite substantial and beyond the financial possibilities of the migrants' close family, requiring financing from larger kinship networks. In this model, the family acts like a bank that finances migration for some other members. The borrowers remit funds in order to repay the loans, which are put toward more loans for other family members including the extended family that are willing to migrate.

van Dalen et al. (2005) investigate the effects of remittances on emigration intentions of households in Egypt, Morocco and Turkey. They use a large household survey conducted in the years 1996 and 1997 for these three countries. The survey contains information on whether receipts of remittances in households in these countries encourage or discourage emigration intentions of its members. They find that receipt of remittances contributes to new flows of migration. Thus, workers' remittances signal to family members staying behind that it is worthwhile to move abroad and join the remitter. An important conclusion from this study is that remittances contribute to new flows of emigration and possibly in the direction of the countries where the remitters reside. Remittances thereby strengthen the chain migration.

In this paper we investigate the effects of remittances on the decision to migrate for the Turkish-German migration over the period 1964-2004. Given the studies above, to the best of our knowledge, there is not any macro migration model that theoretically incorporates and empirically tests the effects of workers' remittances for the decision to migrate. Rapoport and Docquier (2006) put this down to the lack of long-time series data for most developing countries, a difficulty in measuring remittances and the economic structure of developing countries such as the large informal sector, the degree of financial development and political instability that deliver biased results. However, they also add that there is some scope for the analysis of countries at intermediate stages of development and for which the statistical apparatus can be sufficiently developed such as Turkey and Mexico. We agree that given the variety of legal and illegal transmission channels, workers' remittances is very difficult to measure. However, we also believe that the data we obtained from the Bundesbank represent the main trends for the Turkish workers' remittances from Germany. In our modelling, we aim at analysing the short- as well as the long-run effects of remittances on the decision to migrate, applying the most recent econometric techniques to the longest time series data available. Additionally, in this study we deal with the nonstationarity of the long time series macroeconomic variables. In particular, we develop a parsimonious, stable-coefficient time-series error correction model for migration that incoorporates remittances.

In addition to the economic variables that are typically chosen as the traditional determinants of international migration, like host-home country income differential, unemployment rates in the host and the receiving countries, we add a variable that captures the intensity of economic cooperation between Germany and Turkey. It is approximated by the share of total trade (i.e., sum of exports and imports) between these two countries in total trade of Turkey. Inclusion of this variable could be justified on the grounds that the volume of trade can serve as an indicator of the level of business linkages between these two economies as well as economic opportunities that may lower informational and adjustment costs, level of uncertainty, and certain other prohibitive factors that are associated with the decision to migrate. Therefore, we expect that high level of business involvement between the two countries will facilitate and promote international labour movement. In addition, the significance of the trade flows in the migration equation will shed light on whether trade and migration are complements or substitutes: there is still a lack of theoretical agreement and empirical findings are rare.

The remainder of this paper is organized as follows: the next section gives some background information on Turkish migration to Germany as well as on remittances from Germany to Turkey. In Section 3 we derive the theoretical model and discuss the empirical model. In Section 4 the econometric methodology is described and the empirical results are presented. Section 5 summarises the findings.

2 Turkish Migration to Germany: Background

Turkish workers' remittances from Germany constitute a large share (80%) of total remittances to Turkey. During the 1970s and 1980s total remittances reached 4% of Turkish GDP, and remittances from Germany were 3% of Turkish GDP, (see Figure 1), ranking Turkey in the top ten largest remittance receiving countries. [In Figure 1, log of remittances (R_t) is expressed as a ratio to Turkish GDP.]

During the period 1964-2005 Turkish workers' remittances from Germany totalled 47.5 billion Euros, capital inflows and foreign direct investment from Germany only summed up to 17.8 billion Euros and 4.2 billion Euros, respectively. Remittances have not only been one of the major sources of foreign exchange, but are also a relatively stable source of foreign exchange compared ranging from 1.9 billion Euros to 0.8 billion Euros to foreign direct investment and other private capital flows. Hence, remittances helped to buffer the negative shocks to the economy such as during 1994 and 2001 economic crisis. More importantly, remittances are directed to households and individuals, while other sources of external financing, such as foreign aid, goes to public agencies in the receiving countries, jeopardising their effectiveness due to corrupt government officials (Kapur, 2005).

Successive Turkish governments encouraged labour emigration starting with Turkey's first five-year development plan (1962-1967). The first plan argued that the export of excess unskilled labour to Europe would encourage return flow remittances and alleviate unemployment as well as the balance of payment difficulties in Turkey. Turkish governments have made efforts to attract remittances through foreign exchange deposit schemes with attractive interest rates, special import privileges, premium exchange rates and special investment schemes for workers living abroad. In the 1960s and 1970s workers' remittances indeed helped to overcome the deficit in the Turkish balance of payments. In 1974 total remittances accounted to 90% of total Turkish exports.

The recruitment agreements shaped the initial stage of migratory flows significantly. However, later migratory movements have had their own dynamics and mechanisms. From 1973, with the oil crisis, official foreign employment in all western European countries including Germany came to an abrupt halt and November 1973 was the formal end of immigration. However, only 11-14% of the immigrants in Germany returned to their home countries in the two years that followed the 1973 crisis. This could be explained with "the Law of Family Reunification" which first came into effect in March 1974. It allowed foreign workers to reunite with their family members. Hence, Turkish migration took the form of family unification and migration increased in the 1970s (see Figure 1). In Figure 1, M_t represents log gross inflows of Turkish migrants to Germany, expressed as of a share of the home population. Additionally to this law, guest workers' agreements, the so-called "rotation model", met with resistance from the outset by employers who complained that they had to continously train new workers. In 1971 the residence permit renewal was made easier. The residency status of the guest workers were strengthened and foreign employees were allowed to bring their families. By May 1972, 40% of all the guest workers residing in Germany benefited from the residency permits.

The increase in migration since 1982 could be explained with the increase in asylum applications. The annual average number of citizens from Turkey officially registered as asylum seekers increased from about 10,000 in the early 1980s to 80,000 in the late 1980s and early 1990s. As a reaction to this, the Bundestag (Lower House of the German Parliament) agreed to the "asylum compromise" in 1993 which made applying for political asylum in Germany considerably more difficult. As a result of this, the number of applications for asylum has continuosly declined. However, in 1995 and 1996 the number of applicants slightly increased again, but since then they stayed at low levels. In addition to regional conflicts, the increase in asylum applications stemmed from the fact that numerous migrants had taken recourse to this entry channel, due to restrictions on migration policies. However, one should bear in mind that the number of officially accepted asylum-seekers from Turkey is relatively low compared to the number of applicants mentioned above.

As in Joppke (1998) argued with the stop of recruitment in 1973, the migration took the form of chain migration that arose from family unification and asylum seeking that is contradiction to the German no-immigration policies. Legal constraints together with moral obligations rather than the political process toward historic Turkish immigrants can explain the continuing immigration despite explicit zero-immigration policies since the early 1970s, see Joppke (1998).

Therefore, given the information above, in spite of the restrictive immigration policies over the period, we can argue that migration patterns and therefore migration pressures are determined mainly by the supply-push factors together with employment opportunities in Germany that is considered to be an important demand-pull factor.

Thus, the economic slow-down in 1999 and the economic crisis in 2001 in Turkey, and hence widening income differences between Germany and Turkey (Y_{ft}/Y_{ht}), business links T_{hf}, together with the high unemployment rate in Turkey (U_{ht}) and Germany (U_{ft}), respectively, can contribute to explain the recent pattern of migration flows, (M_t) in Figure 1. However, one important observation from the data is that gross migration inflows and remittances follow each other very closely and show similar patterns that suggest investigating the role of remittances in the decision to migrate. [6] Here, whether the causality runs from remittances to migration or from migration to remittances is an important concern and will be handled in the econometric specifications by means of exogeneity tests.

3 Theoretical and Empirical Model

A migrant i decides whether to migrate from his home country h to the foreign (host) country f, (m_{ihf}) and this decision depends on the difference in earnings between the home and the host country, net of the amount of remittances sent home and the migration costs. One important assumption of this model is that the migrant makes the migration decision jointly with his family. The presence of high migration costs in the presence of distance and imperfect capital markets are the main reasons for the self-enforcing contractual agreements between the migrant and the family. Migration costs are especially binding for the Turkish migrants as they are unskilled with low income and are distant from Germany. Mayda (2007) finds distance between destination and origin countries to be the most important migration cost. However, migration costs do not only include the actual moving cost, the cost of searching for a job, the

[6] We have also compared the time series patterns of the stock of Turkish migrants in Germany and the net flows of Turkish migrants in Germany with remittances. The data show no co-movement between the stock of the Turkish population in Germany and remittances and the net flows of migration with remittances. This result indicates that recent migrants are the main remitters, which might be due to the fact that earlier migrants let the families follow them and do not need to remit as much as the recent migrants. This could also be explained with the "implicit loan theory" which says that the recent migrants might finance their cost of migration with loans from their families and remit in order to pay back these loans.

cost of living until a job is found and the time and money cost of obtaining a passport and visa, but also the cost that will occur due to adverse shocks to income in destination country.

The model presented here follows closely Borjas (1987, 1999),Hatton (1995), Clark et al. (2002), Péridy (2006) and Mayda (2007), but is augmented with the role of remittances in the decision to migrate inspired from Stark (1991). As in Glytsos (1988) we assume that a migrant decides to migrate if there is a positive net income surplus and that the migrant would like to remit only a fraction of his income surplus. Therefore, migration will only take place if the earnings in the host country are greater than the earnings in the home country adjusted for the remittances and the cost of migration as given in condition 1. In addition, an adverse shock to the income in the destination will be part of the cost of migration, and the cost will be covered by the remittances within the period. The model therefore considers also the case where migration is conceived as a risk-reducing familial strategy within the theory of new economics of labour migration.

Then the equation 1 is given by:

$$m_{ihf} = W_{if} - R_i - W_{ih} - C_{ihf} \tag{1}$$

The wages in the home country, W_{ih}, and the host country, W_{if}, depend on average wages in the home and host countries, α_h and α_f, respectively. R_i is the remittances and has a mean μ_r and variance σ_r^2. C_{ihf} reflects the migration cost for individual i that is shared with the migrant's family.

We assume that $Cov\,(W_{if}, R_i) > 0$ and $Cov\,(W_{ih}, R_i) \lesseqgtr 0$ and the other covariances to be equal to zero.

Migration cost is given by:

$$C_{ihf} = C_{hf}\,(U_{fh}, T_{hf}) + C_i \tag{2}$$

C_{hf} reflects the migration costs that are the same for all individuals i who will migrate from the home country h to the foreign (host) country *f*. According to the new economics of labour migration, the cost of migration is shared with the migrant's family and hence, the unemployment rate in the destination country can be considered as one of the components of migration costs. It is added to the theoretical model as the difference between the unemployment rate abroad and at home, U_{fh}. The presence of business ties between countries, expressed as the magnitude of trade T_{hf}, can further reduce the cost of migration. Indeed, it is suggested and found that the higher the trade flows between two countries are the more business ties between countries and the higher migration flows there exist (Razin and Sadka, 1997; Pedersen et al., 2006; Péridy, 2006). In addition, the trade variable in a migration equation is included to investigate whether trade and migration are complements or substitutes. Theoretical underpinnings that investigate how trade affects international labour mobility can be found in Schiff (2006). The sign of the trade variable will have important implications for the policy, as a policy change affecting trade will result in a positive or negative change in migration flows. For instance, trade liberalisation for the host country may have unwanted consequences, if trade and migration are complements.

Substituting the means of wages and remittances and equation 2 into equation 1 gives:

$$m_{ihf} = (\alpha_f - \alpha_h) - R_i - C_{hf}\left(U_{hf}, T_{hf}\right) - C_i \tag{3}$$

Summing up for all individuals, the expected emigration rate from country h to country f is:

$$M_{hf} = 1 - \Phi\left(\frac{-\alpha_f + \alpha_h + \mu_r + C_{hf}\left(U_{hf}, T_{hf}\right) + \mu_c}{\sigma_{M_{hf}}}\right) \tag{4}$$

where α_f, α_h, μ_r and μ_c are the means of the foreign wages, the home wages, remittances and the individual-specific costs, respectively. Φ is the standard normal distribution function and $\sigma_{M_{hf}}$ is the standard deviation of m_{ihf} which is equal to:

$$\sigma_{M_{hf}} = \sqrt{\left(\sigma_{wf}^2 + \sigma_{wh}^2 - 2\sigma_{wh}\sigma_{wf} + \sigma_r^2 - 2\sigma_{wf}\sigma_r - 2\sigma_{wh}\sigma_r + \sigma_c^2\right)} \tag{5}$$

This is a modified version of Roy model that is advanced first by Borjas (1987) and then others, Hatton (1995), Borjas (1999), Clark et al. (2002), Péridy (2006) and Mayda (2007).

Given the theoretical model above we will model Turkish migration to Germany as in generally accepted functional form, Borjas (1987, 1999), Hatton (1995), Clark et al. (2002), Péridy (2006) and Mayda (2007):

$$\ln M_t = \alpha_0 + \alpha_1 \ln(Y_{ft}/Y_{ht}) + \alpha_2 U_{ft} + \alpha_3 U_{ht} + \alpha_4 \ln T_t + \alpha_5 \ln R_t + \varepsilon_t \tag{6}$$

where M_t denotes gross inflows of Turkish migrants to Germany, expressed as the share of the home population. Brücker and Schröder (2006) argue that the migration stocks, instead of the (net) migration rate, should be used in migration estimations, as an equilibrium relationship between migration stocks and the explanatory variables arises in the long run, while net flows become zero. However, in this study we use the gross migration rate as in Borjas (1987, 1999), Hatton (1995), Clark et al. (2002), Pedersen et al. (2006), Péridy (2006) and Mayda (2007), not the stock of Turkish migrants. We test the hypothesis that the decision to migrate is made jointly by the migrant and his family, costs and returns are shared within self-enforcing contractual arrangements between the two parties which implies that workers who emigrate pay their debts during their first year. Over time, they bring their families to Germany, and do not need to remit as much as the recent migrants. This implies different remittance behaviour for the stock of Turkish migrants. Therefore, we take the gross migration rate rather than stocks or net inflows. In addition, we have the trade intensity as an independent variable, which requires working with flows rather than the stock of migrants. Furthermore, the initial data analysis did not provide evidence for any significant relationship between the stocks and the explanatory variables, especially workers' remittances.

The $\ln(Y_{ft}/Y_{ht})$ is the log of the relative income in the host and the home countries, measured as per capita GDP in purchasing power parity terms, capturing the pecuniary incentives to migration that results from income differentials. U_{ft} is the unemployment rate in the host country (Germany). It captures the migration cost as well as the employment opportunities in the destination country. The German immigration policies becomes more restrictive during the period of high unemployment in Germany, see Mayda and Patel (2004). Therefore, the unemployment rate in Germany represents an important demand-pull factor of international migration that is the destination country's restrictive migration policies.

While U_{ht} is the unemployment rate in Turkey and represents the push factor in the decision to migrate. Therefore, the unemployment rates enter into the empirical model individually rather than as a difference term.[7] T_t is the proxy for intensity of economic cooperation between Turkey and Germany, which is calculated as the log of the share of trade volume (sum of exports and imports) between these two countries in the total trade volume of Turkey with all its trading partners. Finally, R_t is the log of the ratio between workers' remittances and Turkish GDP. The data on workers' remittances are obtained from Bundesbank, while the data on per capita GDP of Germany and Turkey have been obtained from the OECD. The data on Turkish unemployment, population and trade have been gathered from the Turkish Institute of Statistics. The data on Turkish migration and German unemployment are obtained from the Federal Statistical Office in Germany.

4 The Econometric Approach

In our modelling of the Turkish migration to Germany, we follow the general-to-specific approach advocated in Hendry (1995). We start with an unrestricted VAR(p) model that can be transformed into the error-correction form

$$\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta x_{t-i} + \mu + \varepsilon_t, \varepsilon_t \sim N_n(0, \Sigma) \tag{7}$$

where μ denotes a constant drift term. In short, we first test for cointegration and subsequently impose the implied reduced rank restrictions on the unrestricted VAR model. Then we test for the long-run exogeneity of the system variables. The results of the weak exogeneity tests are used to build a parsimonious time series model for migration that satisfactorily passes all diagnostic tests, displays constant coefficients, and possesses the ability to accurately forecast migration flows within-sample.

The vector of variables is given by $x_t = (\ln M_t, \ln(Y_{ft}/Y_{ht}), U_{ft}, U_{ht}, \ln T_t, \ln R_t)'$. The annual data covers the period from 1964 until 2004, see Figure 1.

In our modelling, the first step is to determine the lag length of an unrestricted VAR(p) model. At this stage, we aim to obtain a parsimonious model, which is quite challenging given the relatively small number of observations ($T = 41$) compared to the number of explanatory variables ($k = 6$). In Table 2 it is shown that the VAR(1) model can adequately describe the data, as the misspecification tests report no serious departures from the underlying model assumptions. The univariate as well as multivariate model diagnostic tests comprise: F_{AR} – test of no residual autocorrelation (see Godfrey (1978)); χ^2_{Norm} – test

[7] This does not change the results of the estimation.

for the normally distributed residuals (see Doornik and Hansen (1994); F_{Hetero} and $F_{Hetero-X}$ – White (1980) tests for heteroscedasticity based on the original and squared regressors, and on the original and squared regressors, and their cross-products; F_{ARCH} – Engle (1982) test of no residual autoregressive conditional heteroscedasticity. The graphics, regression output, and residual diagnostic tests were all calculated using GiveWin 2.2 and Pc-Give 10.2 (see Doornik and Hendry, 2001a,b).

Having found the adequate unrestricted model, the next step is to find the cointegration rank of the estimated system by imposing restrictions on the unrestricted model. We use the Johansen Full Information Maximum Likelihood (FIML) procedure for this purpose, Johansen (1992). Table 3 reports on the results of the trace and λ-max tests. Both tests indicate the presence of one cointegrating relation in the system.

Thus we impose the cointegration rank $r = 1$ on the system (eq. 7) and proceed with testing for (trend-) stationarity, long-run exclusion, and long-run weak exogeneity of the variables in our model. The test for stationarity of the variables in the model is based on Johansen and Juselius (1992). This is a multivariate version of the Augmented Dickey-Fuller test with the null hypothesis of stationarity. Since any linear combination of I(1) variables that is I(0), or I(0) variables themselves, can form the cointegration space, this test aims to find whether any of the variables in our model alone belong to the cointegration space. This test has an asymptotic χ^2 distribution with $(k - r) = 5$ degrees of freedom.

The test for the long-run exclusion (Johansen and Juselius, 1992) investigates whether any of the variables in our model can be excluded from the cointegrating vector. This test has an asymptotic χ^2 distribution with $r = 1$ degrees of freedom. Finally, the test for the long-run weak exogeneity investigates whether the dependent variable adjusts to the equilibrium errors represented by a cointegrating relation.

Tables 4, 5, and 6 report on the results of the tests for (trend-) stationarity and long-run exclusion which are performed on the matrix of the long-run coefficients, and the tests for long-run weak exogeneity which are performed on the matrix of the adjustment coefficients, respectively. According to the stationarity test, the null hypothesis that each variable is either I(0), or I(0) around a linear deterministic trend, is decisively rejected. The tests for the long-run exclusion rejects the null hypothesis that $\ln M_t$, U_{ft}, U_{ht} and T_t can be excluded from the cointegrating vector at the 1% significance level, and the variable $\ln R_t$ at the 10% significance level. At the same time, we cannot reject the null hypothesis that the relative income variable ($\ln(Y_{ft}/Y_{ht})$) could be omitted from the cointegrating relationship. The likely reason for such an outcome is that the relative income ratio fluctuated more or less around the same magnitude in the period of investigation, see Figure 1. However, we have chosen to retain it, as there is a strong theoretical argument for its presence in migration functions and, arguably, its persistence has been and still is the major pulling factor behind Turkish migration to Germany given its magnitude. In addition, it turns out that after imposing the four long-run weak exogeneity restrictions we are no longer able to reject the null hypothesis of the long-run exclusion of the relative income variable at the 10% significance level, as explained below.

According to the univariate long-run weak exogeneity test results (see the upper panel of Table 6), we can accept the null hypothesis that all but $\ln M_t$ variables are individually weakly exogenous at any conventional significance level. This result indicates that the causality runs from remittances to migration, and not from migration to remittances. Moreover, the joint test for the long-run weak exogeneity also confirms this finding with the log likelihood ratio test statistic of 3.973 [p=0.553]. In order to check, whether this result is robust to the change in the sample size, we show the value of the recursive test statistics of the joint null hypothesis, scaled by the 1% critical value, in Figure 2. Figure 2 further supports the hypothesis that the five variables $U_{ft}, U_{ht}, \ln(Y_{ft}/Y_{ht}), \ln T_t, \ln R_t$ are weakly exogenous with respect to the long-run parameter values for all sample sizes (with one exception only). Hence, this restriction is acceptable, in our further analysis we treat these five variables as weakly exogenous with respect to the long-run parameters.

Imposing the long-run weak exogeneity restrictions on the $\ln(Y_{ft}/Y_{ht}), U_{ft}, U_{ht}, \ln T_t, \ln R_t$ variables results in the following cointegrating vector with the corresponding standard errors reported in parentheses below the coefficient estimates:

$$\ln M_t = \underset{(0.862)}{1.646} \ln\left(\frac{Y_{ft}}{Y_{ht}}\right) - \underset{(0.016)}{0.216} U_{ft} + \underset{(0.029)}{0.102} U_{ht} + \underset{(0.281)}{1.492} \ln T_t + \underset{(0.055)}{0.205} \ln R_t + constant \tag{8}$$

All the coefficient estimates have the expected signs and all estimates are significantly different from zero at the conventional significance levels. The relative income, the unemployment rate in Turkey, the trade intensity and workers' remittances contribute positively to emigration, and unemployment in Germany contributes negatively. Thus, in the long- run, the supply as well demand factors jointly determines migration flows. We find a large effect from the trade intensity variable, as it is estimated that a 10 percent increase in trade will increase the gross migration inflows by 14.92 percentage points. This is a very large effect, especially compared to the other studies in the literature, Pedersen et al. (2006) and Péridy (2006). This result my be related to the fact that Germany is Turkey's biggest trading partner. Similarly, a 10 percent increase in remittances will increase the gross migration inflows by 2.05 percentage points, a practically significant effect.

As shown in Johansen (1992), the long-run weak exogeneity of variables allows us to reformulate the model (eq. 7) in terms of a conditional model, where we condition on the current and past values of the weakly exogenous variables, and the error correction term. After removing the variables that have turned to be insignificant, the estimated conditional model for $\ln M_t$ looks as follows:

$$\begin{aligned}\Delta \ln M_t \quad = \quad & \underset{(0.073)}{0.407}\ \Delta\ \ln R_t - \underset{(0.034)}{0.144}\ \Delta\ \ln R_{t-1} - \underset{(0.034)}{0.283}\ \Delta\ U_{ft} \\ & - \underset{(0.092)}{0.624}\ ecm_{t-1} - \underset{(0.166)}{0.527}\ D99 - \underset{(1.077)}{7.219} \\ & \widehat{\sigma} = 0.15,\ R^2 = 0.85,\ T = 41,\ F_{AR(1-4)} = 0.579\ [0.874], \\ & F_{ARCH(1-4)} = 0.262\ [0.899],\ \chi^2_{Norm}(2) = 0.218\ [0.897], \\ & F_{Hetero} = 3.24\ [0.954]\end{aligned} \tag{9}$$

with the corresponding standard errors reported in parentheses below the coefficient estimates.[8]

The conditional model (eq. 9) is parsimonious and at the same time the diagnostic tests show no signs of misspecification. The error-correction term is highly significant with the expected sign. It is worth noting that remittances and the German unemployment rate are also significant in the conditional model, with the expected signs, and exerting dampening and promoting effects on the Turkish migrant inflows to Germany, respectively. Thus, a 10 percent increase in the change in remittances will increase the change in gross migration flows by 4.07 percentage points. That is a large short-run effect considering the coefficients on other short-run variables, and it is almost as large as the error-correction term. Hence, the significance of remittances in the short- as well as in the long-run supports the view held in new economics of labour migration that the decision to migrate is made jointly with the family rather than individually. The positive effects further suggest that remittances trigger additional migration in the short- as well as in the long-run. This is one of the predictions of the "implicit loan" theory that remittances are used as loans for the extended family members who might like to migrate. In addition, the German unemployment rate that is an important demand-pull factor is also significant in the short- as well as in the long -run, indicating that the process that generates Turkish migration is determined jointly by supply-push and demand-pull factors. Therefore, the significant effects from the supply side suggest that the restrictive immigration policies are not binding for the Turkish migration flows, but having impact only through the German unemployment rate.

The conditional model has very good explanatory power as it can be assessed by looking at the actual values and the regression fitted values as well as the regression residuals (see Figure 4). The coefficient estimates are well determined and exhibit remarkable stability according to the recursive Chow stability tests, the one-step ahead residuals as well as recursively estimated coefficients (see Figures 5 and 6). Finally, the conditional model is able to accurately forecast gross migration inflows to Germany over the period 2000-2004 (see Figure 7 for the one-step ahead forecasts), and this fact is supported by the Chow parameter constancy forecast F-test statistic which takes the value 0.420 [p=0.831].

[8] The dummy variable is included to avoid the failure of normality test.

5 Conclusion

In this paper we investigate whether Turkish migration to Germany can be best explained by the traditional migration theories or the new economic of labour migration. For this reason we develop a model for Turkish migration to Germany for the period 1964-2004 using the cointegration technique. A single cointegrating vector is found among the gross migration inflows and the following explanatory variables: the relative income ratio between Germany and Turkey, the unemployment rates in Germany and Turkey, the trade intensity variable, calculated as the share of total trade between Germany and Turkey in total Turkish volume of trade, and the remittances as a ratio to Turkish GDP. Based on the results of the cointegration analysis and imposed long-run weak exogeneity restrictions, a parsimonious single equation conditional error-correction model is developed that has good in-sample explanatory power and possesses well-defined and stable coefficients. The significance of remittances in the short- as well as in the long-run supports the view of the new economic of migration that Turkish migration decision is taken jointly with the migrant's family.

By including the trade variable in the empirical migration function, our study contributes to the better understanding of the relationship between the trade intensity between countries and migration. Thus the business linkages and networks between these two economies significantly facilitate mobility of Turkish nationals between Turkey and Germany by relaxing financial constraints, as well as by lowering various adjustment and informational costs that are associated with the decision to migrate. Furthermore, the results suggest that trade and migration are complements so that any trade liberalisation will further increase migration inflows.

Finally, our findings suggest that workers' remittances can be an important source of financing migration and may trigger additional migration and thereby strengthen the chain migration. Remittances may also be interpreted as an indicator for financial success of those who emigrated, which may encourage potential emigrants to emigrate. The results are consistent with the "implicit loan" theory: high initial migration costs that are binding for unskilled migrants with low income and low access to credit markets encourage the development of kin networks, whereby migrant and his extended family enter into an informal, but mutually beneficial credit contract to cover the costs of migration. However, this could lead to further greater obligations on the part of this migrant to help extended family members to join them overseas and hence remittances are used as loans for other family members who are willing to migrate.

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Table 1: VAR model: Multivariate tests

Multivariate tests		
$F_{AR(1-2)}(72{,}103)$	1.321	[0.097]
$\chi^2_{Norm}(12)$	23.495	[0.024]*
$F_{Hetero}(252{,}52)$	0.425	[1.000]

Table 2: VAR model: Univariate tests

Univariate tests						
	$\ln M_t$	$\ln(Y_{ft}/Y_{ht})$	U_{ft}	U_{ht}	$\ln T_t$	$\ln R_t$
AR 1-2 test: F(2,32)	3.356	0.897	1.6783	1.828	0.855	3.8081
	[0.048]*	[0.418]	[0.203]	[0.177]	[0.435]	[0.033]*
Normality test: $\chi^2(2)$	8.0503	1.5146	0.094	4.033	0.449	1.228
	[0.018]*	[0.469]	[0.954]	[0.133]	[0.799]	[0.541]
ARCH 1-1 test: F(1,32)	0.275	0.311	0.445	5.173	0.024	0.249
	[0.604]	[0.581]	[0.510]	[0.030]*	[0.878]	[0.621]
Hetero test: F(12,21)	0.527	1.3425	0.628	1.676	0.961	0.694
	[0.874]	[0.268]	[0.796]	[0.145]	[0.512]	[0.740]
Hetero-X test: F(27,6)	1.252	1.016	0.235	1.746	0.334	0.362
	[0.421]	[0.545]	[0.996]	[0.252]	[0.977]	[0.968]

Table 3: VAR model: cointegration tests

Rank	Trace test	[Prob]	Max test	[Prob]
0	101.56	[0.017]*	39.81	[0.050]*
1	61.76	[0.185]	25.77	[0.346]
2	35.98	[0.402]	22.54	[0.199]
3	13.44	[0.869]	8.15	[0.887]
4	5.29	[0.777]	5.14	[0.726]

Table 4: VAR model: tests for (trend-)stationarity

$\ln M_t$	$\ln(Y_{ft}/Y_{ht})$	U_{ft}	U_{ht}	$\ln T_t$	$\ln R_t$	trend	$\chi^2(v)$	p-value
Stationarity								
.	0	0	0	0	0		31.544	[0.000]**
0	.	0	0	0	0		22.798	[0.000]**
0	0	.	0	0	0		27.974	[0.000]**
0	0	0	.	0	0		22.703	[0.000]**
0	0	0	0	.	0		31.628	[0.000]**
0	0	0	0	0	.		25.325	[0.000]**
Trend-stationarity								
.	0	0	0	0	0	.	25.734	[0.000]**
0	.	0	0	0	0	.	20.407	[0.000]**
0	0	.	0	0	0	.	32.769	[0.000]**
0	0	0	.	0	0	.	27.222	[0.000]**
0	0	0	0	.	0	.	32.464	[0.000]**
0	0	0	0	0	.	.	16.111	[0.0065]**

Notes: '0' denotes the zero restriction on the coefficient of the corresponding variable, '·' denotes unrestricted coefficient in the 5×1 cointegration vector when testing for the stationarity and 6×1 cointegration vector when testing for trend-stationarity of the variables.

The number of degrees of freedom v in the χ^2 tests corresponds to the number of zero restrictions imposed.

Table 5: VAR model: tests for long-run exclusion

$\ln M_t$	$\ln(Y_{ft}/Y_{ht})$	U_{ft}	U_{ht}	$\ln T_t$	$\ln R_t$	$\chi^2(v)$	p-value
0	.	.	.	.	.	14.011	[0.000]**
.	0	.	.	.	.	0.623	[0.430]
.	.	0	.	.	.	12.936	[0.000]**
.	.	.	0	.	.	6.708	[0.009]**
.	.	.	.	0	.	12.143	[0.001]**
.	.	.	.	.	0	5.476	[0.019]*

Notes: '0' denotes the zero restriction on the coefficient of the corresponding variable, '·' denotes unrestricted coefficient in the 5×1 cointegration vector when testing for the long-run exclusion of the variables.
The number of degrees of freedom v in the χ^2 tests corresponds to the number of zero restrictions imposed.

Table 6: VAR model: tests for long-run exogeneity

$\ln M_t$	$\ln(Y_{ft}/Y_{ht})$	U_{ft}	U_{ht}	$\ln T_t$	$\ln R_t$	$\chi^2(v)$	p-value
0	.	.	.	.	.	7.8233	[0.005]
.	0	.	.	.	.	0.0769	[0.781]
.	.	0	.	.	.	1.2818	[0.257]
.	.	.	0	.	.	0.347	[0.555]
.	.	.	.	0	.	0.003	[0.956]
.	.	.	.	.	0	0.523	[0.469]
	0	0	0	0	0	3.973	[0.553]

Notes: '0' denotes the zero restriction on the adjustment coefficient of the corresponding variable, '·' denotes unrestricted coefficient in the 6×1 vector of the adjustment coefficients.
The number of degrees of freedom v in the χ^2 tests corresponds to the number of zero restrictions imposed.

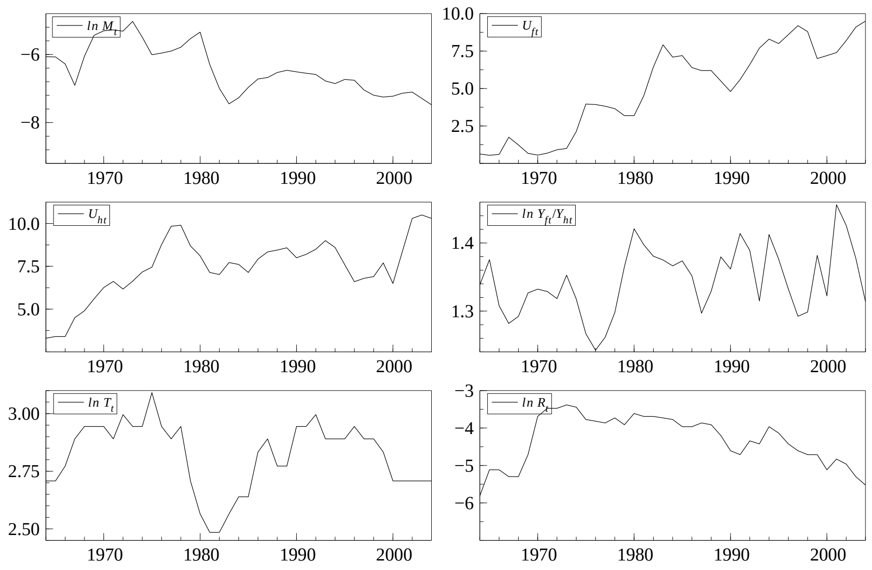

Figure 1: Data plots, 1963 - 2004

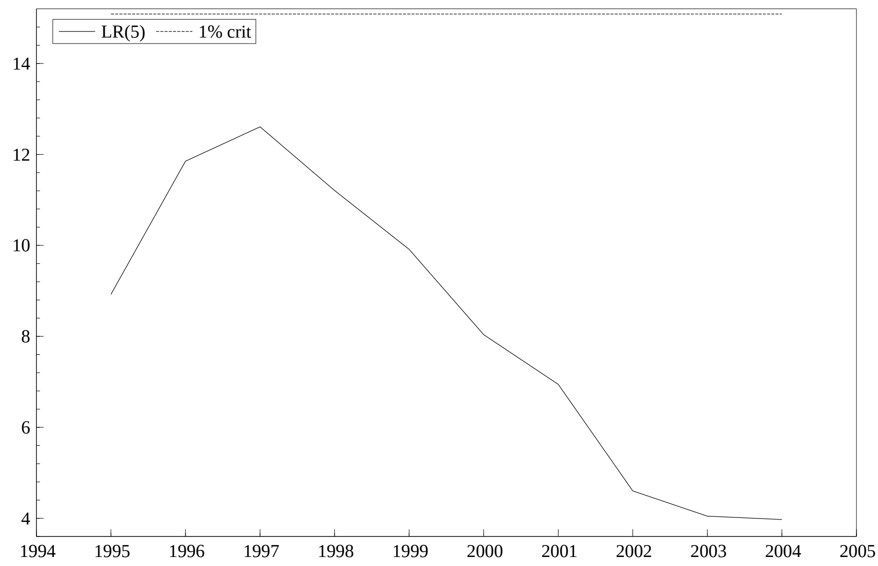

Figure 2: Recursive test statistic for long-run weak exogeneity of $\ln(Y_{ft}/Y_{ht})$, $\ln U_{ft}$, $\ln U_{ht}$, $\ln T_t$, $\ln R_t$, scaled by the 1% critical value

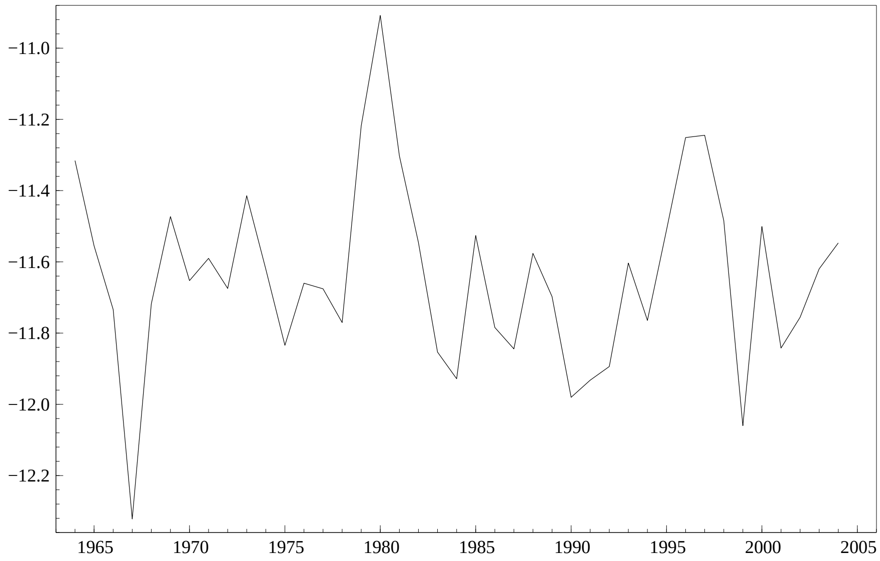

Figure 3: Cointegrating relation, equation (eq. 8)

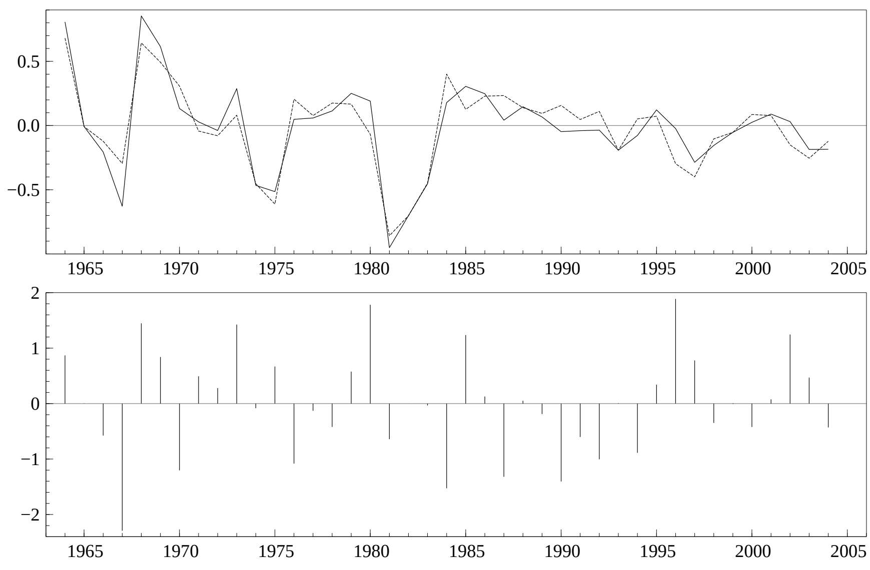

Figure 4: Actual (solid line), fitted (dashed line), and residual values for the conditional model (eq. 9)

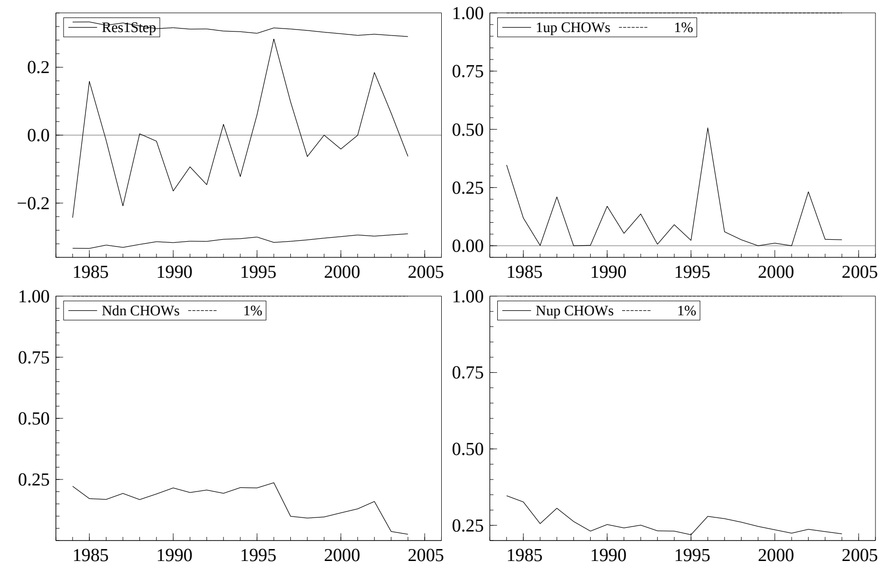

Figure 5: The recursive Chow test statistics scaled by the corresponding 1% critical values and the one-step residuals (Res1step) for the conditional model (eq. 9)

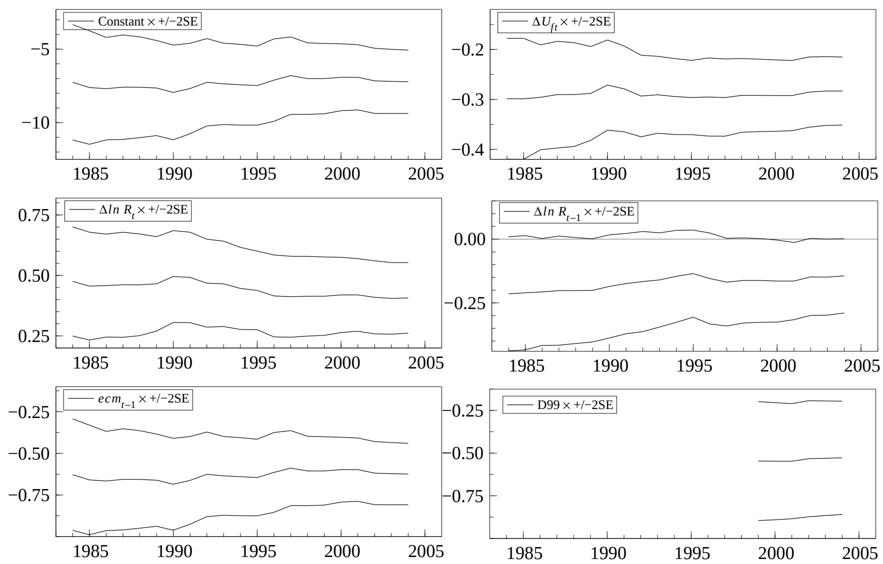

Figure 6: The recursively estimated coefficient values for the conditional model (eq. 9)

Figure 7: 1-step (ex post) forecasts (dashed line) for the conditional model (eq. 9)